

Motion Planning for Autonomous Driving: The State of the Art and Future Perspectives

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Abstract

Intelligent vehicles (IVs) have gained worldwide attention due to their increased convenience, safety advantages, and potential commercial value. Despite predictions of commercial deployment by 2025, implementation remains limited to small-scale validation, with precise tracking controllers and motion planners being essential prerequisites for IVs. This article reviews state-of-the-art motion planning methods for IVs, including pipeline planning and end-to-end planning methods. The study examines the selection, expansion, and optimization operations in a pipeline method, while it investigates training approaches and validation scenarios for driving tasks in end-to-end methods. Experimental platforms are reviewed to assist readers in choosing suitable training and validation strategies. A side-by-side comparison of the methods is provided to highlight their strengths and limitations, aiding system-level design choices. Current challenges and future perspectives are also discussed in this survey.